

Assessment Cycle 2025 – 2026

Program: Bachelor of Science (BS) in Biology (618)

Department of Biology and Microbiology

School of Science, Technology, Engineering, & Math

College: Arts and Sciences

Prepared by: Dr. Jerry Brunson

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Approved by: Dr. Francene J. Lemoine, Dean

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Northwestern Mission. Northwestern State University is a responsive, student-oriented institution committed to acquiring, creating, and disseminating knowledge through innovative teaching, research, and service. With its certificate, undergraduate, and graduate programs, Northwestern State University prepares its increasingly diverse student population to contribute to an inclusive global community with a steadfast dedication to improving our region, state, and nation.

College of Arts and Sciences' Mission. College of Arts and Sciences' Mission. The College of Arts & Sciences, the largest college at Northwestern State University, is a diverse community of scholars, teachers, and students, working collaboratively to acquire, create, and disseminate knowledge through transformational, high-impact experiential learning practices, research, and service. The College strives to produce graduates who are productive members of society equipped with the capability to promote economic and social development and improve the overall quality of life in the region. The College provides an unequaled undergraduate education in the social and behavioral sciences, English, communication, journalism, media arts, biological and physical sciences, and the creative and performing arts, and at the graduate level in the creative and performing arts, English, TESOL, and Homeland Security. Uniquely, the College houses the Louisiana Scholars' College (the State's designated Honors College), the Louisiana Folklife Center, and the Creole Center, demonstrating its commitment to community service, research, and preservation of Louisiana's precious resources.

School of Science, Technology, Engineering, & Math. The School of Science, Technology, Engineering and Math at Northwestern State University serves to create a collaborative environment for natural and applied science education that inspires students and faculty to engage in an interdisciplinary approach to developing strong analytical skills in interpersonal communication, critical thinking, research, and data literacy as they become lifelong learners who are prepared for an ever-changing, global STEM community.

Department of Biology and Microbiology Mission Statement. The mission of the Northwestern State University Biology and Microbiology Department is to provide comprehensive education in biology and microbiology for all of our majors and to create

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a unique training environment for students wishing to pursue graduate or professional education.

Purpose (optional): The primary goal of the Biology program is to prepare students to enter the job market competitively at the bachelor level or to further their education in either graduate or professional school.

Methodology: The assessment process for the Biology program is as follows:

- (1) Data from assessment tools (both direct and indirect, quantitative, and qualitative) is collected and returned to the program coordinator.
- (2) The department head will analyze the data to determine whether students have met measurable outcomes.
- (3) Results from the assessment will be discussed with the program faculty.
- (4) The Department Head as well as the faculty will propose changes to measurable outcomes and/or assessment tools for the next assessment period and, where needed, curricula and program changes.

Student Learning Outcomes:

SLO 1. Students will explain the basic concepts of the molecular basis of life.

Course Map: Tied to the course syllabus objectives

BIOL1010: Biological Principles I. All majors are required to complete BIOL1010.

Measure 1.1. (Direct – knowledge):

Throughout the course, students will learn about the molecular basis of life including macromolecules, cellular structure, enzyme function, gene expression, cellular respiration, photosynthesis, DNA structure and function, genetics, and cellular division. Each student is required to pass a quiz covering these concepts. The target is to have 70% of students attain a quiz grade of $\geq 70\%$.

Findings: Target not met.

Analysis: In AC 2024-2025, the target was met with 77% (41/53) of students scoring $\geq 70\%$ on the assessment. This was due to the extra time spent on these topics in the lecture and the use of materials on the Mastering platform. This was the second consecutive year that the target was met.

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Based on the analysis on the AC 2024-2025, the following changes were made in AC 2025-2026. The Department Head met with the course steward and faculty and improved data collection by the course steward. The faculty aligned course materials and assisted a new faculty member that was hired to teach this course who had excellent results. As a result of the changes in AC 2025-2026, target was not met with 56% (14/25) of students scoring $\geq 70\%$ on the assessment. This implies that students could not demonstrate appropriate knowledge of the molecular basis of life. This is a decrease of 21% from AC 2024-2025. The changes made should not have negatively impacted the score.

Decision: In AC 2025-2026, the target was not met. Based on the analysis of AC 2025-2026, in AC 2026-2027, the faculty will implement the following changes to drive the cycle of improvement. The faculty will meet with the Department Head and course stewards to discuss ideas of the cause of this drop if one can be identified. A Success Coach was hired for this class who will hold tutoring and supplemental instruction. To improve scores in the upcoming cycle, faculty will incentivize students to attend Success Coach sessions by offering this as an assignment. There was some unexpected confusion with faculty this year about the SLOs. To resolve this, a handout will be provided to faculty discussing each SLO and how they are each to be specifically assessed.

Measure 1.2. (Indirect – survey):

At the end of the course, a survey is administered to students to gauge their appraisal of their understanding of the basic concepts covered in the course. The target is to have 70% of the students report an above-average or excellent knowledge of the indicated concepts.

Findings: Target not met.

Analysis: The target was not met for AC 2024-2025, with only 32% (17/53) of students reporting that they had an above-average or excellent understanding of basic cellular structure. Additionally, 23% (12/53) students reported that they had an above average or excellent understanding of basic cellular function. For the second consecutive year students reported lack of confidence in knowledge that they demonstrated in SLO 1.1. Having the qualifiers for each level of understanding seemed to help in this cycle, and the survey was moved to the end of the semester.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. The faculty spent more time focusing on student confidence in class by using active learning assignments where they had the opportunity to apply the knowledge that was attained throughout the semester. As a result of the changes, the target was not met for AC 2025-2026 with 28% (7/25) of students reporting that they had an above-average or excellent understanding of basic cellular structure and 32% (8/25) of students reported that they had an above-average or excellent understanding of basic cellular function. This is a decrease of 4% and an increase of 9%, respectively, from AC

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2024-2025. Students did not master the content this year, and rightfully so, were not confident in their knowledge base.

Decision: In AC 2025-2026, the target was not met. Based on the analysis of the AC 2025-2026 assessment results, in AC 2026-2027, the faculty will implement the following changes to drive the cycle of improvement. Students' confidence in their knowledge base continues to wane. Unlike the previous two years where students did demonstrate mastery of content (SLO 1.1), students struggled this year although their confidence levels were similar to past years. Thus, the Department Head will meet with the faculty prior to the start of the AC 2026-2027, to more directly approach the topic of confidence in the classroom. This measure has not been met in several years. Active learning assignments were used to indirectly boost confidence but failed to do so. To boost faculty confidence for SLO 1.2, the Department Head will discuss with faculty about changing our target score to 70% of the students reporting an average or above knowledge of the indicated concepts. This change may feel more attainable to faculty thereby improving scores in the classroom and would aid in a more realistic view of students who feel that they understand these concepts.

SLO 2. Students will describe the role of evolution and ecology in the diversity of life.

Course Map: Tied to the course syllabus objectives

BIOL 1020: Biological Principles II. All majors are required to complete BIOL 1020.

Measure 2.1. (Direct – knowledge):

Throughout the course, students will learn about evolution and ecology. The topics covered include natural selection, evolution, ecology, population genetics, taxonomy, the diversity of prokaryotes, protists, fungi, plants, and animals. Each student is required to pass a quiz covering these concepts. The target is to have 70% of students attain a quiz grade of $\geq 70\%$.

Findings: Target not met.

Analysis: In AC 2024-2025, the target was met with 80% (24/30) of students in BIOL 1020 attaining a quiz grade of 70% or higher. After 2 years of improving outcomes in this SLO, students finally showed mastery on the concepts of ecology and evolution. The faculty had met and made minor changes to the questions to better align their assessment of the content area.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. The course stewards improved data collection from faculty to ensure the smooth transition of data. The course stewards also met with the faculty and discussed this SLO to ensure consistency in the assessment provided at the end of the

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semester. The department purchased more hominid skulls to enhance evolution lectures. As a result of the changes in AC 2025-2026, the target was not met with 60% (18/30) of biology majors in BIOL 1020 attaining a quiz grade of 70% or higher. This is a decrease of 20% from AC 2024-2025. After meeting the SLO last cycle, this cycle students did not demonstrate mastery of evolution and ecology concepts.

Decision: In AC 2025-2026, the target was not met. Based on the analysis of AC 2025-2026, the faculty will implement the following changes in AC 2026-2027 to drive the cycle of improvement. Prior to the start of AC 2026-2027, the Department Head will meet with the course steward and the faculty to discuss new assignments and whether those assignments should be based on active learning strategies. Required attendance at faculty-led tutoring sessions will also be discussed.

Measure 2.2. (Indirect – survey)

At the end of the course, a survey is administered to students to gauge their appraisal of their understanding of the basic concepts covered in the course. The target is to have 70% of the students report an above-average or excellent knowledge of the indicated concepts.

Findings: Target not met.

Analysis: In AC 2024-2025, the target was not met with 37% (11/30) of students in BIOL 1020 reporting an above-average or excellent understanding of basic concepts in evolution and 37% (11/30) of biology majors reporting an above average or excellent understanding of basic concepts of ecology. The questions were reviewed, but no changes were made. These were added as part of the final in the class. Additional time was spent on ecology to boost that score.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. Active learning assignments were developed for use in the class to apply knowledge already learned to boost confidence. As a result of the changes in AC 2025-2026, the target was not met with 39% (11/28) of biology majors in BIOL 1020 reporting an above-average or excellent understanding of basic concepts in evolution and 36% (10/28) of biology majors reporting an above average or excellent understanding of basic concepts of ecology. This is an increase of 2% and a decrease of 1% respectively, compared to AC 2024-2025, and short of the measure's target. Students do not feel confident in their knowledge base.

Decision: In AC 2025-2026, the target was not met. Based on the analysis of the AC 2025-2026 results and to drive the cycle of improvement in AC 2026-2027, the Department Head will meet with faculty to discuss self-confidence in the classroom. Active learning assignments are not working to indirectly boost confidence. There needs to be a more direct approach which needs to be developed. This target has not been met for many years. Thus, it may help to lower the score to make the goal more attainable. During the next cycle, we will discuss changing the target to 70% of the students reporting

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an average or above knowledge of the indicated concepts. This would aid in identifying students who do feel comfortable and confident of their knowledge level and may boost confidence in faculty who are administering these assessments, leading to an improvement in the classroom.

SLO 3: Students will be able to communicate scientific information.

Course Map: Tied to the course syllabus objectives

BIOL 4995: Scientific Communication. All majors are required to complete BIOL 4995.

Measure 3.1. (Direct – ability):

Throughout all sections of Scientific Communication courses, students will learn about the various aspects of communication in the sciences. Each student will write a scientific article which will be assessed using a standard rubric. The target is to have 70% of students attain a final average quiz grade of $\geq 70\%$.

Findings: Target met.

Analysis: In AC 2024-2025, the target was met with 90% (34/38) of biology majors scoring $\geq 70\%$ on the assessment. Effective resources and material (*i.e.*, guides on how to write in science and the assessment rubric) were shared among faculty including a new faculty member that taught it this cycle.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. Faculty assigned and worked on improving each section of the article independently of the other sections. This reduced the mental and physical workload of the students, and the sections were combined at the end of this assessment to make a full article. As a result of the changes in AC 2024-2025, the target was met in AC 2025-2026 with 96% (42/44) of biology majors scoring $\geq 70\%$ on the assessment. This is an increase of 6% from last year. The results demonstrated that Biology majors are graduating with the ability to communicate science in the form of a scientific article.

Decision: In AC 2025-2026, the target was met. Based on the analysis of AC 2025-2026, the faculty will implement the following in AC 2026-2027 to drive the cycle of improvement. Prior to the start of the next AC, the Department Head will meet with faculty to review the rubric for improvement and clarity and will discuss best practices for submission of the paper components (*i.e.*, order to produce each component of the paper since they have been divided into a series of micro-assignments) as well as the possibility of increasing the target to better challenge the students and faculty.

Measure 3.2. (Direct – ability)

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Throughout all sections of Scientific Communication courses, students will learn about the various aspects of communication in the sciences. Each student will present to the public a non-traditional communication of a scientific article/project developed by the student; the communication will be assessed using a standard rubric. The target is to have 70% of students attain a final score on this assignment of $\geq 70\%$.

Findings: Target met.

Analysis: In AC 2024-2025, the target was met with 97% (37/38) of biology majors scoring $\geq 70\%$ on the assessment. The faculty met to share rubrics and handouts/guides for creating non-traditional communications that were effective at driving results and to ensure that students had access to rubrics.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. The faculty developed guidelines on what was accepted as a non-scientific communication to address equity concerns (*i.e.*, a simple social media post on Twitter vs. creating a podcast episode). This was aligned across all sections and addressed any student equity concerns thereby improving student morale, and hopefully, effort on this project. As a result of the changes in AC 2024-2025, the target was met in AC 2025-2026 with 100% (44/44) of biology majors scoring $\geq 70\%$ on the assessment. This is an increase (+3%) from AC 2024-2025. This result demonstrates that students can effectively communicate science in a non-traditional manner, such as a podcast or infographics for social media (*i.e.*, Instagram, *etc.*) or some other manner that effectively targets the general public.

Decision: In AC 2025-2026, the target was met. Based on the analysis of AC 2025-2026 and to drive the cycle of improvement in AC 2026-2027, the Department Head will meet with the faculty to review the rubric to ensure that it aligns with our new guidelines for what is a non-scientific communication. To meet equity concerns, the rubric should clearly define this to avoid future loopholes used by students. The faculty will also discuss enhancing the target to this measure to further drive excellence in the classroom.

SLO 4: Students will employ critical thinking to interpret scientific literature.

Course Map: Tied to the course syllabus objectives

BIOL 4970: Capstone Course for Biology, or BIOL 4990, CHEM 4910, or PHYS 4930.
All majors are required to complete BIOL 4970.

Measure 4.1. (Direct - ability)

Throughout all sections of capstone courses, students will read the same scientific article from the primary literature and be required to pass quizzes over the material. The target is to have 70% of students attain a final average quiz grade of $\geq 80\%$.

Findings: Target met.

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Analysis: In AC 2024-2025, the target was met with 70% (16/23) of biology majors scoring $\geq 80\%$ on the assessment. More time was spent on critical thinking skills in class by reviewing papers and data analysis skills by analyzing other scientific articles prior to the tested paper.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. The Department Head met with the faculty prior to the start of AC 2025-2026, to discuss other ways to enhance critical thinking skills. Assignments were created (*i.e.*, students being provided with a data set to analyze) so that students could practice running basic statistics and analyzing data sets. As a result of the changes in AC 2024-2025, in AC 2025-2026, the target was met with 74% (14/19) of biology majors scoring $\geq 80\%$ on the assessment. This meets the target measure of 70%, and is above (+4%) the score from last year's AC. This demonstrates that students can critically analyze a scientific article and effectively communicate this information when required.

Decision: In AC 2025-2026, the target was met. Based on the analysis of AC 2025-2026, the faculty will implement the following to drive the cycle of improvement in AC 2026-2027. This measure will be disconnected from Chemistry and Physics such that a generalized science article will no longer need to be selected. To provide a more effective evaluation for biology students, faculty will choose an article in the specific discipline of biology and will create a new critical thinking exam based on this article.

Measure 4.2. (Direct – ability)

Throughout all sections of capstone courses, students will write a proposal about their capstone project. The target is to have 70% of students attain a final average written assignment grade of $\geq 80\%$ based on a standard rubric.

Findings: Target met.

Analysis: In AC 2024-2025, the target was not met with 96% (22/23) of biology majors scoring $\geq 90\%$ on the assessment. Faculty shared guides on how to draft project proposals with specific information on different sections and evaluated rubrics for consistency across all sections.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. The faculty divided the proposal into smaller specific components and submissions to keep them on track and improve outcomes. The faculty also lowered the target from 90% on the assessment to 80% after falling short in the previous 2 cycles prior to AC 2024-2025. The concern was that the high bar was too difficult to achieve creating a mental barrier in both faculty and students. As a result of the changes in AC 2024-2025, in AC 2025-2026, the target was met with 74% (14/19) scoring $\geq 80\%$ based on a standard rubric. This was 22% below the score in AC 2024-2025 which had a target score of $\geq 90\%$ justifying the drop in the target measure. This demonstrates that Biology

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majors can use their knowledge in the field to devise and write a scientific project proposal which is directly applicable to the workforce.

Decision: In AC 2025-2026, the target was met. Based on the analysis of AC 2025-2026, the faculty will implement the following in AC 2026-2027 to drive the cycle of improvement. The Department Head will meet with faculty to prompt discussion and sharing of materials from faculty who are more effective at stimulating successful project proposals from students. This should help to generate ideas and an impetus for improvement in faculty that are not quite successful as their colleagues in closing the gaps in these classrooms.

SLO 5: Students will demonstrate professional development.

Course Map: Tied to the course syllabus objectives

BIOL 4970: Capstone Course for Biology or BIOL 4990, CHEM 4910, or PHYS 4930.
All majors are required to complete BIOL 4970.

Measure 5.1. (Direct – skill)

Students will be required to give a final presentation graded by a standard rubric across all sections of capstone classes. The target is to have 80% of students give a final presentation that meets $\geq 70\%$ of the prescribed guidelines.

Findings: Target not met.

Commented [DG1]: Align with Decision. Target not met in that section.

Analysis: In AC 2024-2025, the target was not met with 96% (22/23) of biology majors scoring $\geq 70\%$ on the assessment. The assessment was changed this year as discussed in the previous report from 100% scoring $\geq 70\%$ on the assessment to 80% scoring $\geq 70\%$ on the assessment. The students who did not meet the criteria failed to attend class, so faculty adjusted course requirements to make attendance part of grade. New faculty taught the class, so care was taken to ensure that rubrics were aligned and shared among faculty.

Based on the analysis of the AC 2024-2025 results, in AC 2025-2026, the following changes were made. Faculty reached out to students with poor attendance and notified the Department Head of those with several absences. Capstone presentations were created stepwise in sections for accuracy and improvement checks throughout the semester. This lowered the workload on students at the end of the semester. As a result of the changes in AC 2024-2025, in AC 2025-2026, the target was met, with 83% (10/12) of biology majors scoring $\geq 70\%$ on the assessment. This result is 13% below the score in AC 2024-2025, but ends a three-year streak of not meeting the target. This demonstrates that students possess above average ability to present their capstone projects to the general public.

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Decision: In AC 2024-2025, the target was not met. Based on the analysis of AC 2025-2026, the faculty will implement the following in AC 2026-2027 to drive the cycle of improvement. Prior to the start of the next AC, the Department Head will meet with the faculty to identify why students are failing to meet this measure and to generate possible solutions. This measure will be separated from chemistry and physics, so that each area can focus on excellence in their own disciplines as we are in separate departments with different needs.

Commented [DG2]: Previous year's report?

Measure 5.2. (Direct – skill)

At the end of the course, students will find a current entry-level job in a field of biology related to their capstone experiment to relate their project to the current state of the workforce and needs of society. The target is to have 90% of the students meet the requirements of the grading rubric.

Findings: Target not met.

Analysis: In AC 2024-2025, the target was met, with 100% (23/23) of biology majors scoring $\geq 90\%$ on the assessment. Faculty added the requirement to find a job related to their project as part of the rubric, and the Department Head ensured that all faculty were aware of this measure. An in-class project was introduced to get students used to looking at these type of entry-level jobs.

Based on the analysis on the AC 2024-2025 results, in AC 2025-2026, the following changes were made. A similar assignment was made part of the class prior to this assessment to prepare and teach students how to successfully locate careers in their field. As a result of the changes in AC 2024-2025, in AC 2025-2026, the target was not met with 83% (10/12) of biology majors scoring $\geq 90\%$ on the assessment. This result was below (-17%) the scores in last year's AC.

Decision: In AC 2025-2026, the target was not met. Based on the analysis of AC 2025-2026, the faculty will implement the following in AC 2026-2027 to drive the cycle of improvement. Prior to the start of the next AC, the Department Head will meet with faculty to discuss generating guides for students on how to find careers in their field. This assessment will be separated from chemistry and physics to allow these different areas and departments to focus solely on their specific discipline areas which are unique thereby providing the best experience possible for biology majors.

Comprehensive summary of key evidence of improvements based on analysis of results.

The following reflects all the changes implemented to drive the continuous process of seeking improvement in AC 2025-2026. These changes are based on the knowledge gained through the analysis of AC 2024-2025 results.

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- The faculty enhanced time spent on these topics for all measures.
- The Department Head met with the faculty prior to the start of the next academic cycle to improve data tracking and data collection by course stewards for Measures 1 and 2.
- The faculty generated active learning assignments to promote confidence in Measures 1.2 and 2.2.
- In Measure 3.1 and 4.1, the separate components of their assignments were assigned throughout the semester rather than all at once.
- Equity concerns were alleviated by developing guidelines for what is the minimum requirement for a non-traditional communication in Measure 3.2.
- In Measure 4.1, students were provided with a data set to analyze in order to develop their critical thinking skills.
- In Measure 5.1, faculty instituted policies to drive class attendance.
- In Measure 5.2, faculty provided an assignment in class to demonstrate how to locate careers in their field.
- A meeting to share materials and ideas that are successful was held for Measures 3, 4, and 5.

Plan of action moving forward.

- In Measure 1.1, students will be incentivized to attend the Success Coach for Biol 1010 for tutoring and supplemental instruction sessions.
- In Measure 1.2 and 2.2, the faculty will discuss methods to boost student confidence of their knowledge and will lower the target to average understanding of the concepts which may boost confidence and identify those who understand the concepts.
- The Department Head and faculty will investigate the use of active learning assignments and potential assignments to encourage students to attend faculty led tutoring on campus for Measure 2.1.
- For Measure 3.1, the Department Head will meet with faculty to review the rubric for improvement and clarity, to discuss best practices for submission of the paper components (*i.e.*, order to produce each component of the paper since they have been divided into a series of micro-assignments), and to discuss increasing the target measure to better challenge the students and faculty.
- For Measure 3.2, the Department Head will meet with the faculty to review the rubric to ensure that it aligns with our new guidelines for non-scientific communication.
- Measure 4 and 5, will be disconnected from Chemistry and Physics.
- Faculty will choose an article in biology and create a new critical thinking exam on that article in Measure 4.1.
- In Measure 4.2, the Department Head will meet with faculty to prompt discussion and sharing of materials from faculty who are more effective at stimulating successful project proposals from students.

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- The Department Head will meet with the faculty to identify why students are failing to meet Measure 5.1, and to generate possible solutions.
- The Department Head will meet with faculty to discuss generating guides for students on how to find careers in their field in Measure 5.2.